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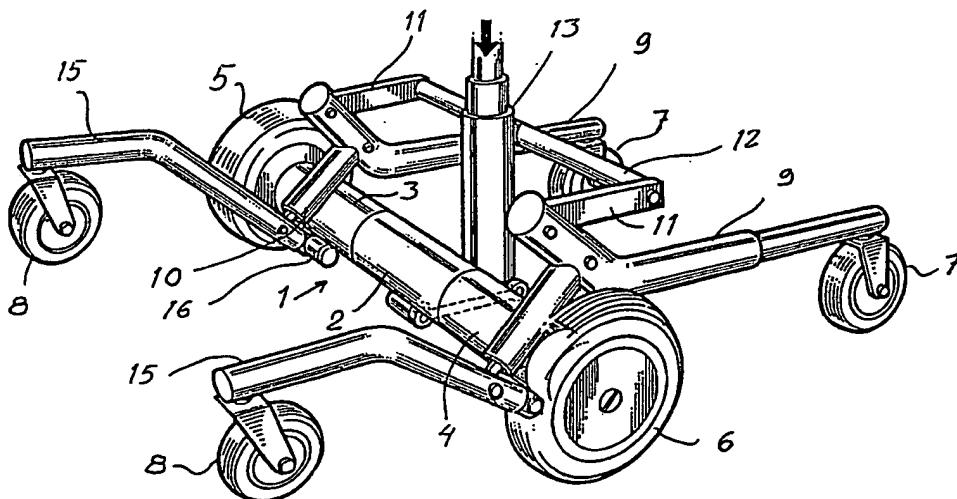
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : <b>A61G 5/04 // A62D 61/10</b>	A1	(11) International Publication Number: <b>WO 90/06097</b> (43) International Publication Date: <b>14 June 1990 (14.06.90)</b>
(21) International Application Number: <b>PCT/SE89/00647</b>		(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), IT (European patent), LU (European patent), NL (European patent), NO, SE (European patent), US.
(22) International Filing Date: <b>9 November 1989 (09.11.89)</b>		
(30) Priority data: <b>8804299-9 28 November 1988 (28.11.88) SE</b>		Published <i>With international search report.</i>
(71) Applicant ( <i>for all designated States except US</i> ): MERCADO MEDIC AB [SE/SE]; Box 1074, S-181 22 Lidingö (SE).		
(72) Inventor; and		
(75) Inventor/Applicant ( <i>for US only</i> ): DU RÉES, Stephan [SE/SE]; Pyrolavägen 24, S-181 60 Lidingö (SE).		
(74) Agents: KRANSELL, Arne et al.; Kransell & Wennborg AB, Sandhamngatan 42, S-115 40 Stockholm (SE).		

(54) Title: A WHEELCHAIR WITH A SIX-WHEEL CHASSIS



(57) Abstract

The invention relates to a wheelchair chassis of the type having a central, transverse main shaft (1) with two drive wheels (5, 6), driven by separate motors, and a front as well as a rear wheel pair, each consisting of two wheels carried by individual supporting arms (9, 15) which are swingable in a vertical plane. The invention solves the problem of how to maintain a constant wheel pressure and an unchanged lateral stability when the wheelchair passes over obstacles tending to tilt it sideways. According to the invention each of the supporting arms (15) of the front wheels is individually swingable around an axis (16) adjacent to the main shaft and arranged, in response to an upwardly directed movement of its free end, triggered by its wheel passing an underlying bump, via a linkage (17, 18, 19, 11) to convert this movement to the other front supporting arm which is thereby caused to move downwards in order to maintain a constant wheel pressure.

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A wheelchair with a six-wheel chassis

The present invention relates to a wheelchair chassis of the type comprising a central, transverse main shaft having two drive wheels each driven by its separate electric motor and a front wheel pair as well as a rear wheel pair. Each of those wheel pairs comprises two support wheels, each mounted at the free end of a supporting arm which is swingable in a vertical plane. The supporting arms for the two rear wheels are in unison swingable around the main shaft, whereas the supporting arms of each front wheel is individually swingable around an axis adjacent the main shaft.

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The main advantage of such a motor-powered wheelchair is that it combines a long distance between the front and rear wheels with a small turning radius. The last-mentioned feature is attained thanks to the fact that the propulsion force is transmitted via the central wheels in combination with those being driven individually. This means that the one drive wheel can rotate in the one direction and the other drive wheel simultaneously in the opposite direction, whereby the chassis is turned by being rotated around the center of the main shaft. Close to that shaft is the geometric axis of the vertical cylinder unit supporting the chair proper, meaning that the resulting point of gravity of the chair, with the handicapped person sitting therein, can be located in or very close to the chassis center.

The reason for which each of the four freely rotating

wheels is vertically movable is that such an arrangement is necessary to avoid slipping of the drive wheels and so that the wheelchair can smoothly pass over obstacles. Another reason is that it is desirable to maintain a constant wheel pressure at all wheels even when the chair passes such obstacles.

In one type of prior art arrangements the vertical movements of the four corner wheels are controlled by use of resilient means. However, such means cannot maintain a constant wheel pressure and, in addition thereto, the lateral stability of the wheelchair in connection with obstacle passages is reduced.

The object of the invention is to provide a wheelchair of the type above discussed, which during an obstacle passage, causing the wheelchair to slant laterally, keeps the wheel pressure constant and compensates for the slant so that also the lateral stability remains substantially unaffected. According to the main characteristic of the invention this advantageous performance is realized in a wheelchair chassis having two front supporting arms each of which does, when its free end is raised, due to the corresponding wheel passing an obstacle in the underlying surface, via a linkage convert this upward movement to a downward movement.

One embodiment of the invention will now be described with reference to the drawing.

Figure 1 is a perspective view showing a wheelchair chassis according to the invention and figure 2 is a corresponding elevational view.

- The main, or central, shaft 1 of the chassis has an intermediate section 2 and two end sections 3, 4 each of which is provided with an electric drive motor for the adjacent drive wheel 5 and 6, respectively. The four freely rotating wheels, the rear wheels 7 and the front wheels 8, are according to this embodiment of the swivelling castor type. Each of the rear wheels 7 is mounted at the free end of a supporting arm 9 the front end of which is bent upwards and there connected to an obliquely downward and forward directed sleeve 10, in its turn welded to the motor housings which surround end sections 3, 4 and can turn around shaft 1. The front end of a link arm 11 is connected to the front end of each supporting arm 9 and the rear end of said link arm is rigidly connected to a transverse rod 12 which between its ends is welded to a cylinder unit 13 supporting the chair section (not shown) of the wheelchair.
- 20 Mounted on the bottom part of the main shaft intermediate section 2 is a bushing for the front end of an arm 14 extending backwards and having its rear end articulated to cylinder unit 13 adjacent to the bottom end thereof.
- 25 The front castors 8 are also each supported by an arm 15 the inner end of which is mounted in a bushing 16. Adjacent to that end there is swingably mounted the one end of a link 17 the opposite end of which is articulated to the one leg 18 of a V-shaped link. The other leg of that link is constituted by arm 11 and at its apex it has an axle 19 journaled close to the front end of supporting arm 9. For aesthetical reasons link 17 and leg 18 are located inside sleeve 10 and 35 the front portion of arm 9, respectively.

The operation of the arrangement above described is as follows.

- Let it be assumed that the left (as seen in figure 1) 5 front wheel 8 passes an obstacle in the shape of a bumb on the ground surface. This causes arm 15 to turn clockwise around its bearing 16 and, in the progress, to push link 17 upwards whereby V-link 18, 11 tends to turn counter-clockwise around its axle 19. 10 Due to the connection between the right arm 11, cylinder 13 and rod 12 this produces a reactional force which permits wheel 8 to rise but keeps the wheel pressure constant thanks to the fact that the other front supporting arm is caused to carry out a movement directed downwards. 15

When, in the corresponding manner, the left rear wheel 7 then meets the obstacle, arm 9, sleeve 10 and motor housing 4 are turned around the central shaft causing 20 cylinder 13 to slant whereby the lateral stability and the wheel pressure are maintained.

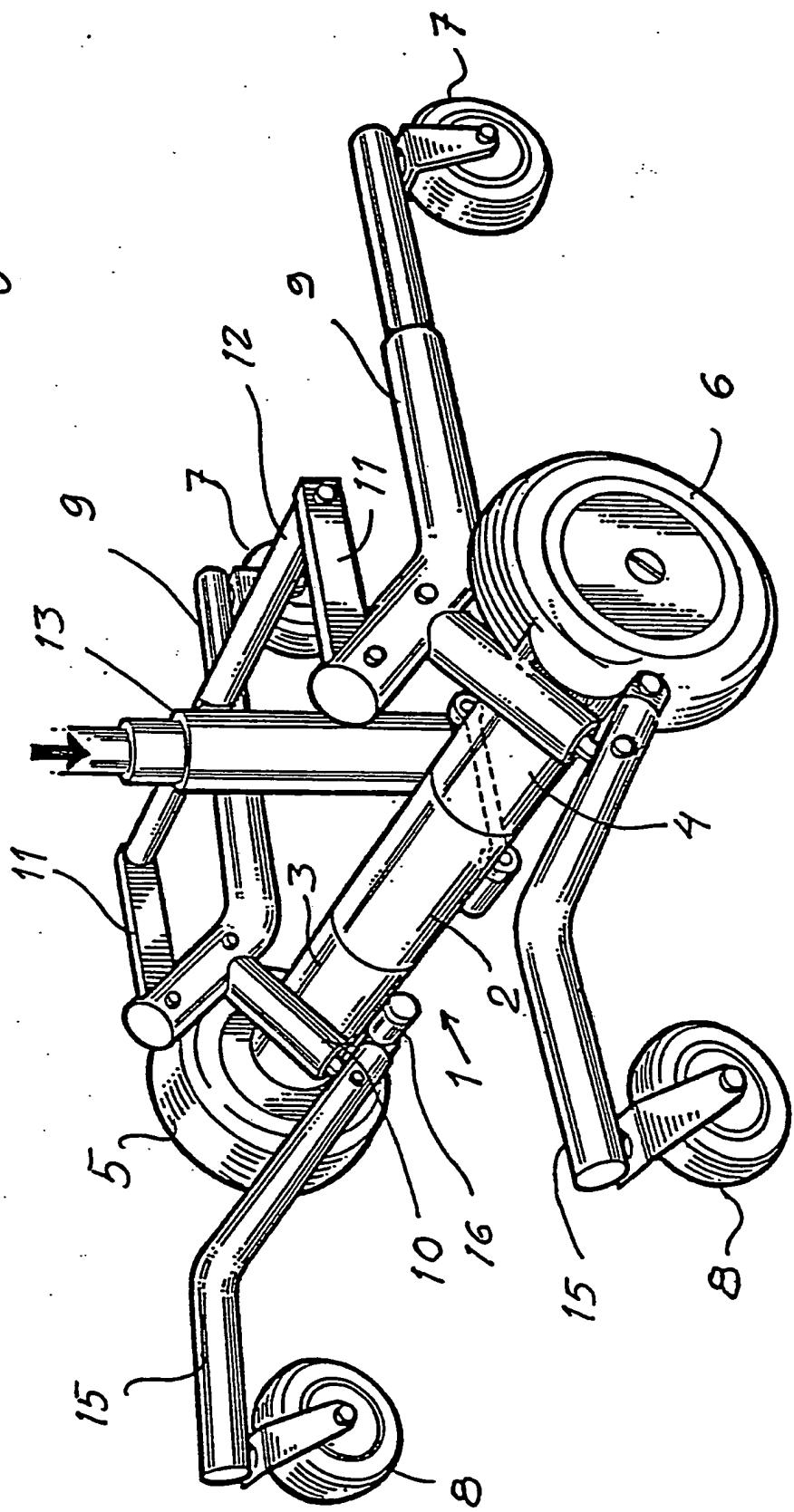
It should be understood that in a wheelchair chassis according to the invention the drive wheels will always maintain their ground contact whereby slipping is avoided and that its ability to pass over obstacles and its lateral stability do not counteract each other. 25

Claims

1. A wheelchair having a chassis with a central, transverse main shaft (1) comprising two drive wheels (5, 6) individually driven by separate motors, and a front wheel pair as well as a rear wheel pair, each constituted by two wheels (7, 8) mounted on individual supporting arms (9, 15), each of which is swingable in a vertical plane, the supporting arms of the two rear wheels being turnable around said main shaft whereas the supporting arms (15) of the two front wheels are individually turnable around an axle (16) near the main shaft, characterized in that each front supporting arm (15) is arranged, in response to a rising movement of its free end caused by its wheel passing a bump in the ground surface, via a link mechanism (17, 18, 19, 11) to transmit this movement to a downward movement of the other front supporting arm for the purpose of maintaining a constant wheel pressure at the front and rear wheels.
2. A wheelchair as claimed in claim 1, characterized in that the link mechanism comprises a link (17) between each front supporting arm (15) and the one end of an angled lever (18, 11) rotatably mounted (19) in the rear supporting arm (9) at the same side of the wheelchair, the other end being articulated to a transverse rod (12), which at its longitudinal center is rigidly connected to a cylinder unit (13) supporting the chair unit of the wheelchair and via a link (14) connected to a sleeve (2) rotatably surrounding the intermediate portion of main shaft (1).

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Fig. 1



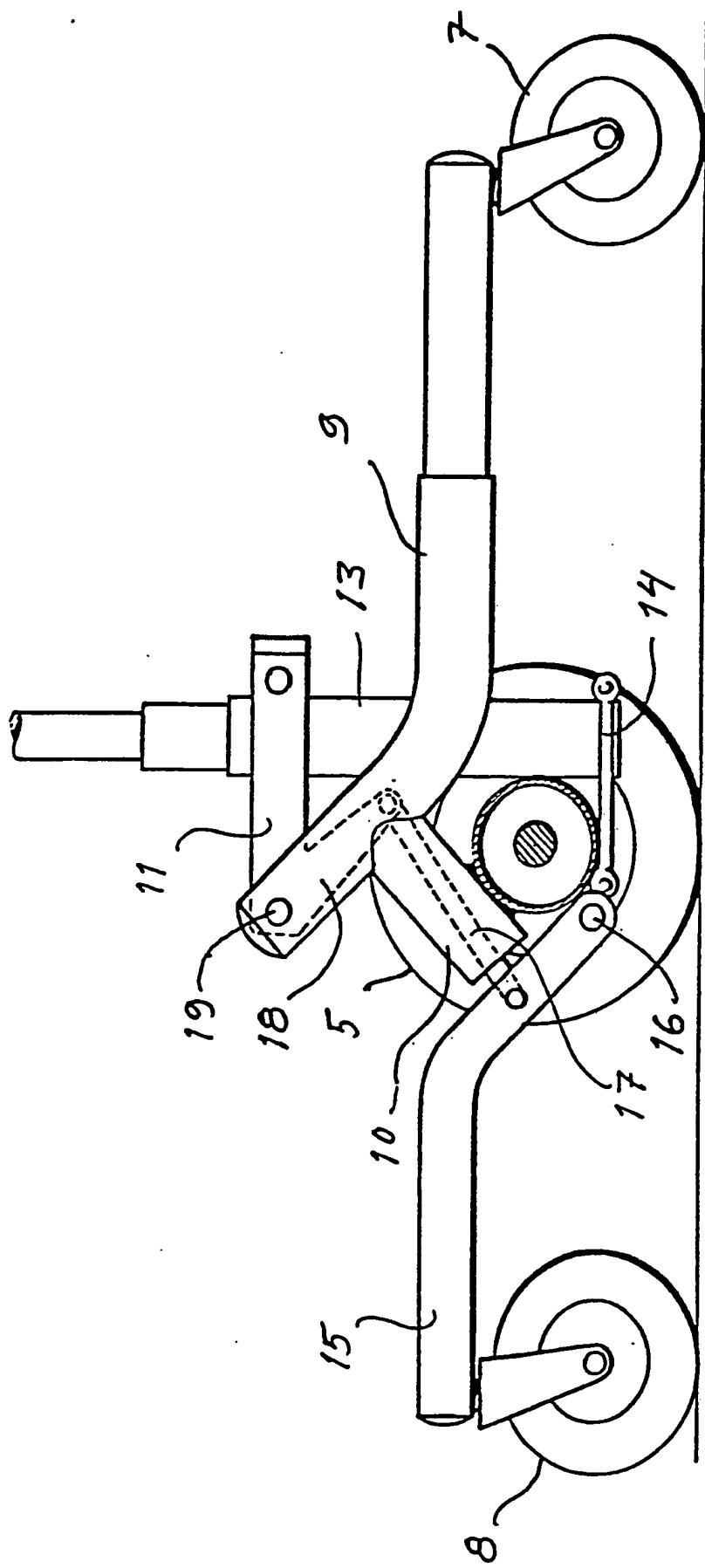


Fig. 2

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/SE 89/00647

## I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) \*

According to International Patent Classification (IPC) or to both National Classification and IPC  
 IPC5: A 61 G 5/04 // A 62 D 61/10

## II. FIELDS SEARCHED

Minimum Documentation Searched ?

Classification System 1	Classification Symbols
IPC5	A 61 G; A 62 D; B 60 G
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *	

SE,DK,FI,NO classes as above

## III. DOCUMENTS CONSIDERED TO BE RELEVANT\*

Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
A	DE, A, 2256934 (SMALLFRY LTD.) 30 May 1973, see the whole document --	1
A	WO, A, 87/06205 (FROST, MAGNUS, R.) 22 October 1987, see the whole document --	1
A	US, A, 3506079 (H.J. MADLER ET AL) 14 April 1970, see the whole document --	1
A	US, A, 4513832 (BO H. S. ENGMAN) 30 April 1985, see the whole document -- -----	1

\* Special categories of cited documents: <sup>10</sup>

- "A" document defining the general state of the art which is not considered to be of particular relevance
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## IV. CERTIFICATION

Date of the Actual Completion of the International Search  
 6th February 1990

Date of Mailing of this International Search Report  
 1990 -02- 07

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Signature of Authorized Officer

Nils Andersson 

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 89/00647**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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